

## Fast GC for Space Applications Based on PIES Technology, Phase II

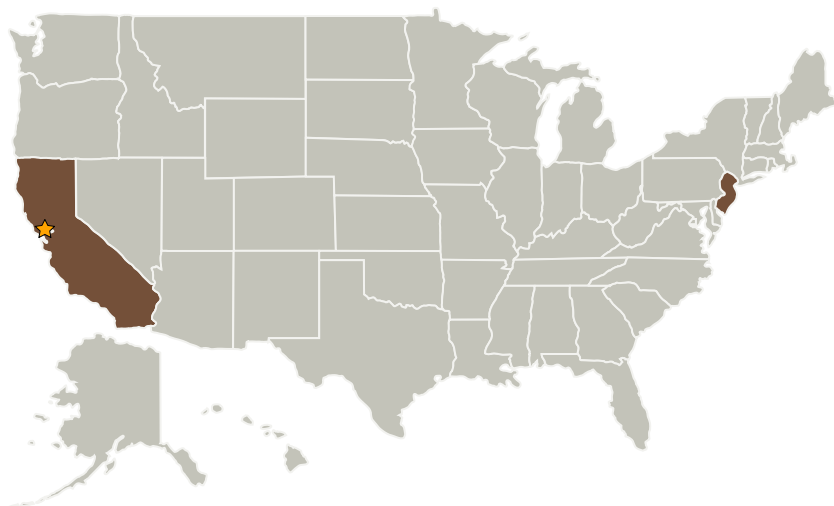
Completed Technology Project (2005 - 2007)



## Project Introduction

This SBIR Phase II project is aimed at the development of an analytical instrument which combines the advantages of fast gas chromatography (GC) and a detector that is capable of sample identification independently from GC retention time. Experiments in the limited-space environment require from a GC system maximum productivity and universality with minimal resource consumption. A combination of a miniature short-column chromatograph with a detector capable of identifying unknown species would be an ideal instrument for flight analysis. A low-resource and power consumption micro-sized GC detector that is proposed for development in Phase II of this project is based on a technology of Penning Ionization Electron Spectroscopy in plasma (PIES). Adding another analytical dimension to the amperometric method that has earlier been employed in the metastable ionization detector (MID), PIES technology relies on the measurement of the energy of electrons liberated by Penning ionization in collisions between analyte molecules and helium metastable atoms in the afterglow of a gas discharge. Since the energy of Penning electrons is specific to the species, the resultant data can be used to identify gas components. No optics or high vacuum is required, and the spectra in this technique are recorded by using a collector electrode placed into a glow discharge cell. In the Phase I of the project, the technology has been expanded to flowing plasmas with linear gas velocities of up to 9.3 m/s where PIES spectra were recorded in  $\sim 1.5$  s. Phase II of the project is focused on further increasing the data acquisition rates, realization of PIES detector in a compact design, development of advanced measurement electronics, and testing the prototype detector with a commercial high-speed gas chromatograph.

## Primary U.S. Work Locations and Key Partners



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## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Areas	2

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission  
Directorate (STMD)

### Lead Center / Facility:

Ames Research Center (ARC)

### Responsible Program:

Small Business Innovation  
Research/Small Business Tech  
Transfer

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Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Lenterra, Inc.	Supporting Organization	Industry	West Orange, New Jersey

## Primary U.S. Work Locations

California	New Jersey
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## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.1 Detectors and Focal Planes